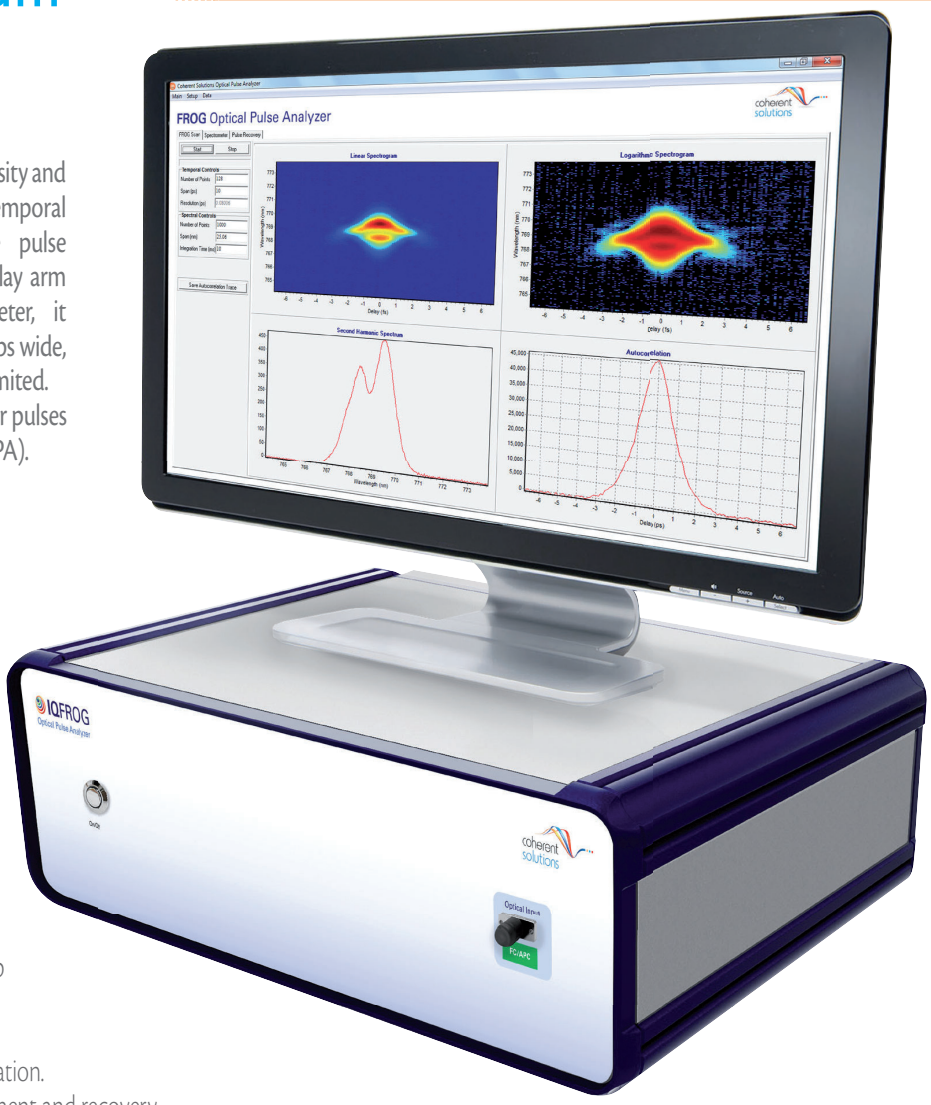
IQFROG 1.0 µm

Frequency-Resolved Optical Gating Pulse Analyzer

The User-Friendly Optical Pulse Analyzer

The IQFROG measures pulse intensity and phase in both spectral and temporal do-mains, yielding a complete pulse characterization. With its long delay arm and high resolution spectrometer, it measures chirped pulses up to 50 ps wide, or up to 7.5 ps wide if transform limited. Making it a perfect fit for seed laser pulses for chirped pulse amplification (CPA).



Key features :

- 1000 - 1100 nm input pulse wavelength range.
- Intensity & phase measurement for pulses 300 fs to 50 ps long.
- Autocorrelation measurement up to 50 ps pulses.
- Connectorized optical input.
- Software driven automated operation.
- Dedicated software for measurement and recovery.

High Spectral Resolution

The FROG measurement technique requires the measurement of second harmonic spectrum of the pulse. The resolution of the spectral measure-ment often limits the broadest pulse width that a pulse analyzer can measure, most other competitive products can only measure pulses less than 1ps.
Coherent Solutions' IQFROG has a built-in high-resolution spectrometer to enable measurement of transform limited pulses of up to 7.5 ps width, or broader if the pulse has a frequency chirp.

Long Temporal Scan Range

The IQFROG uses a long mechanical translation stage to provide up to 200 ps of scan range to allow autocorrelation measurement of up to 50 ps long pulses. It is one of the few pulse analyzers on the market which can measure such broad picosecond pulses, as well as short pulses down to 300 fs width. In comparison the competitive SPIDER technique is limited in the ability to measure pulses broader than 1 ps.

Autocorrelator Function

The IQFROG can scan and save autocorrelation traces, even if the pulse is too broad (with a very narrow spectral width) or is unsuitable for FROG recovery. The IQFROG can be used as an autocorrelator and measure pulses up to 50 ps.

Connectorized Input

The connectorized input makes coupling of the beam easy and fast by eliminating the need to align the beam into the unit manually. IQFROG is by far the most easy-to-use optical pulse analyzer on the market.

Full Software Control

The mechanical control, alignment and tuning is controlled by the software, no more need to align manually.

Ease of Use

The IQFROG with its connectorized input, user-friendly full software control and USB connection to PC, makes it the smarter plug and play pulse analyzer.

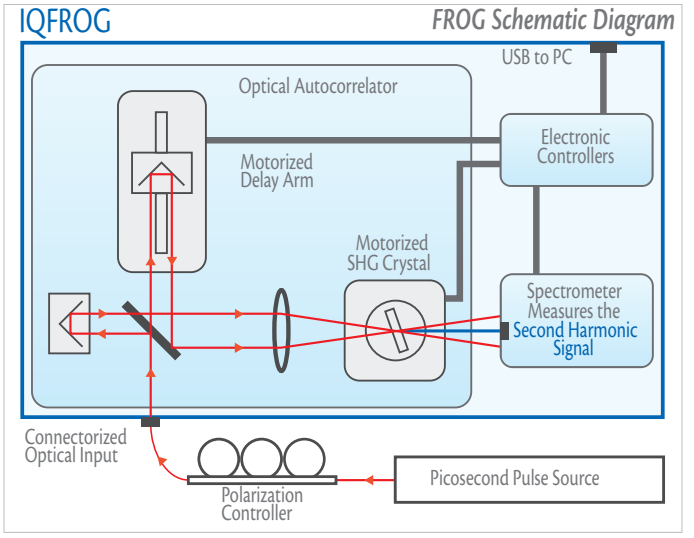
Espace du Ter - 13 Bd Jean Monnet - F-56260 Larmor-Plage - Tél: +33 (0)2 97 35 36 12 - e.mail: info@wavetel.fr - www.wavetel.fr

Frequency-Resolved Optical Gating Pulse Analyzer

IQFROG 1.0 µm

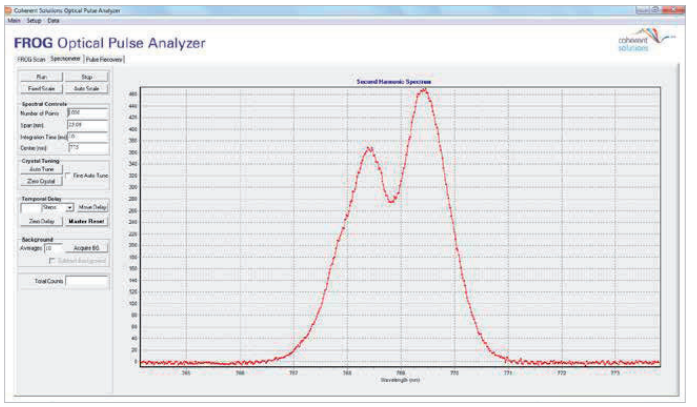
How it works

The IQFROG is a spectrally resolved Second Harmonic Generation (SHG) autocorrelator. It can resolve sub-picosecond pulses since it is not limited by the response time of the detector. At each delay position on the autocorrelation, a complete SHG spectrum is measured, recording both the spectral and temporal characteristics of the pulse simultaneously.
The two dimensional plot of SHG spectrum as a function of delay is referred to as a `spectrogram'. Once a spectrogram has been measured, a fast mathematical recovery algorithm is used to completely recover all the characteristics of the pulse, including pulse shape, spectrum, chirp and group delay.

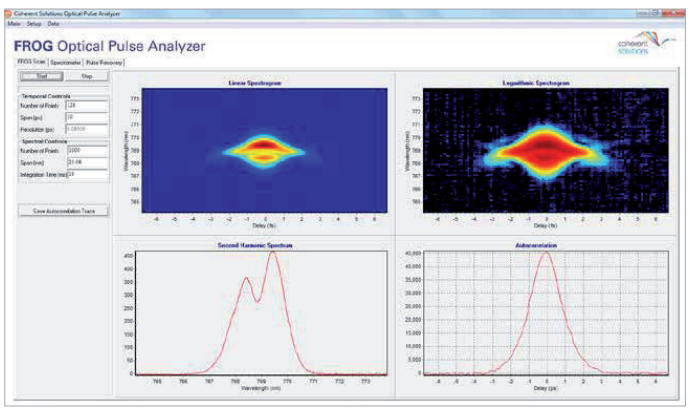


Software User Interface

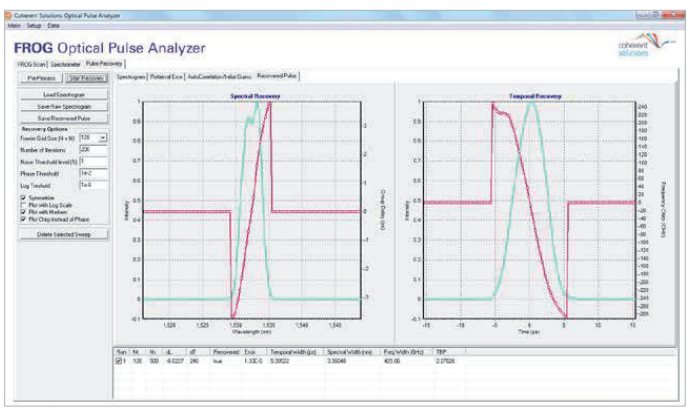
The IQFROG comes with dedicated all-in-one software, «Optical Pulse Analyzer» (OPA) which controls the mechanicals and measures and recovers optical pulses using an intuitive graphical user interface.



Spectrometer functionality displaying the second harmonic spectrum.



FROG Scan functionality measuring the spectrogram and displaying its autocorrelation trace.



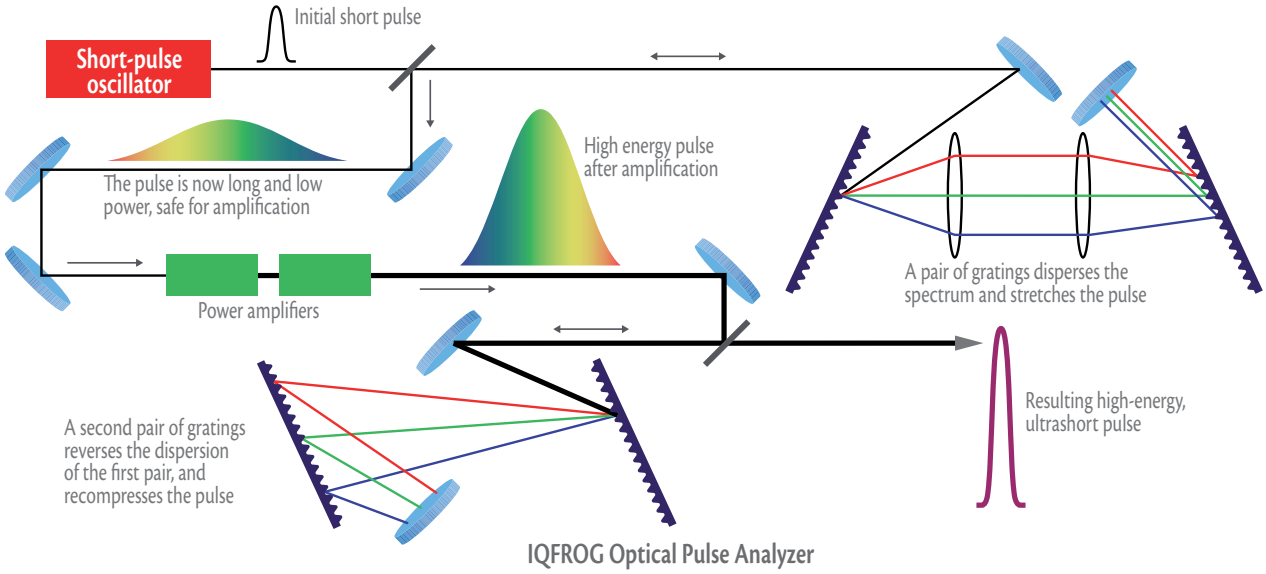
FROG pulse recovery functionality showing the pulse shape and chirp in both temporal and spectral domains.

FROG Applications

High power femtosecond and picosecond optical pulses are used for micromachining applications such as; ablating, etching and cutting of a wide range of materials as they minimize the thermal damage on the substrate. A common technique employed to amplify the power of ultra-short pulses is Chirped Pulse Amplification (CPA).

CPA broadens, amplifies and then compresses the pulse and it is necessary to know the chirp and pulse characteristics at each stages of the CPA. IQFROG measures all the pulse characteristics necessary to optimize the CPA setup.

Chirped Pulse Amplification Diagram



IQFROG Optical Pulse Analyzer

Technical specifications

Crystal type	BBO CRYSTAL	KDP CRYSTAL
Input pulse temporal FWHM[a]	0.3 - 7.5 ps (transform limited pulses)	
Temporal scan range	200 ps	
Temporal resolution	15 fs	
Input centre wavelength[b]	1000 - 1100 nm	
Input pulse spectral FWHM	0.2 - 15 nm	0.2 - 25 nm
Spectral resolution	150 pm	
Pulse repetition rate	Independent	
Input RF clock required	No	
Input peak power (saturation)	0.5 W2	10 W2
Input peak power (sensitivity)[c]	0.002 W2	0.01 W2
Input connector type	FC/APC or FC/PC	

Notes: [a] Broader pulses of up to 50 ps are measureable if the spectral FWHM is within the specified range. - [b] Other centre wavelengths are also available. Please enquire for details. [c] Minimum value needed for a good recovery; product of average and peak power.

General Specification

Dimensions W x D x H	440 x 450 x 128 mm | 17.32 x 17.72 x 5.04 inch
Weight	14 kg | 30.9 lbs
PC interface method	USB 2.0
Operating system requirement	Windows 7, 8 or 10 (32 or 64 bit)
Power supply	~100 - 240 V; 50/60 Hz; 500 W
Operating temperature range	5 °C to 45 °C | 41 °F to 113 °F
Storage temperature range	-40 °C to 70 °C | -40 °F to 158 °F

NOTE: The IQFROG 1.5 µm is also available for characterizing 1520 - 1610 nm wavelength

Ordering Information: **IQFROG 1.0: µm** IQFROG-1.0 MICRON - XXX - XX

Crystal Type
BBO = BBO - Barium Borate
KDP = KDP - Potassium Dideuterium Phosphate

Connector Type
FC = FC/PC
FA = FC/APC
SC = SC/PC
SA = SC/APC

Product Warranty standard 3 yr warranty

All Coherent Solutions' products come with a standard 3 year warranty.

The IQFROG is supplied as the optical pulse analyzer with the software on a media. The computer screen is not included in the package.

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IQFROG 1.5 µm

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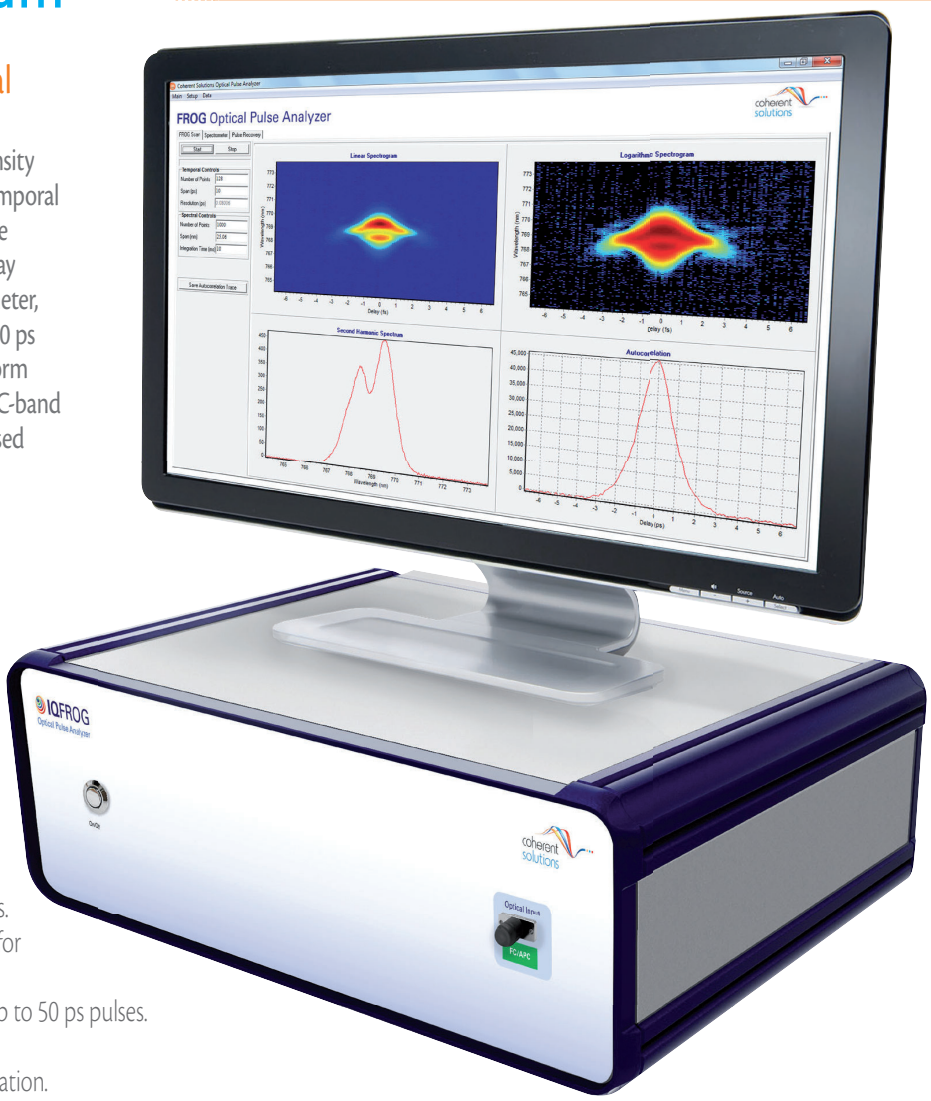

Key features :

- 1520 - 1610 nm input pulse wavelength range.
- Perfect for C & L band fiber lasers.
- Intensity & phase measurement for pulses 300 fs to 50 ps long.
- Autocorrelation measurement up to 50 ps pulses.
- Connectorized optical input.
- Software driven automated operation.
- Dedicated software for measurement and recovery.

High Spectral Resolution

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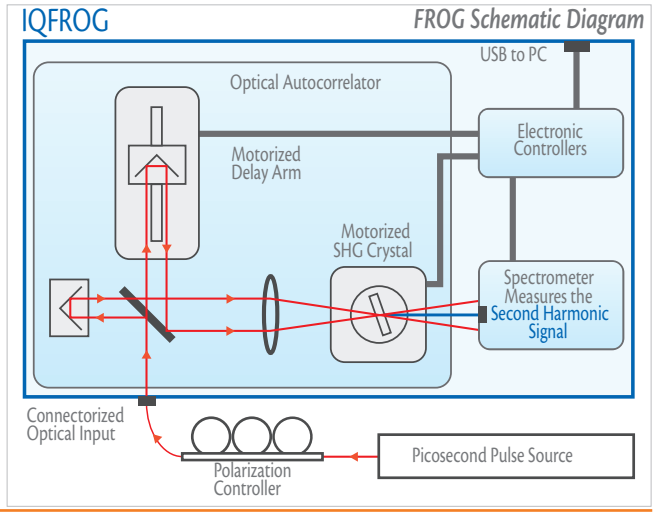

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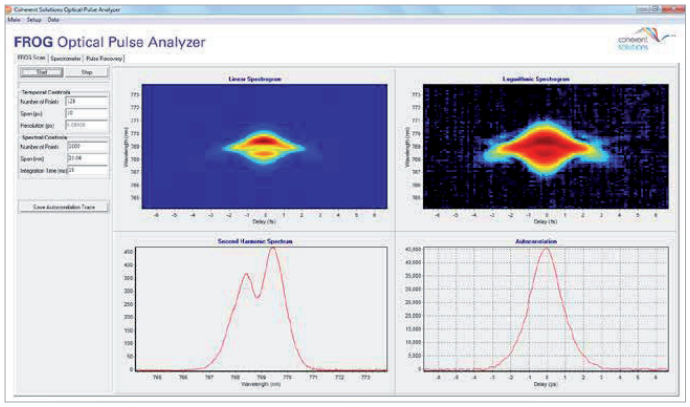

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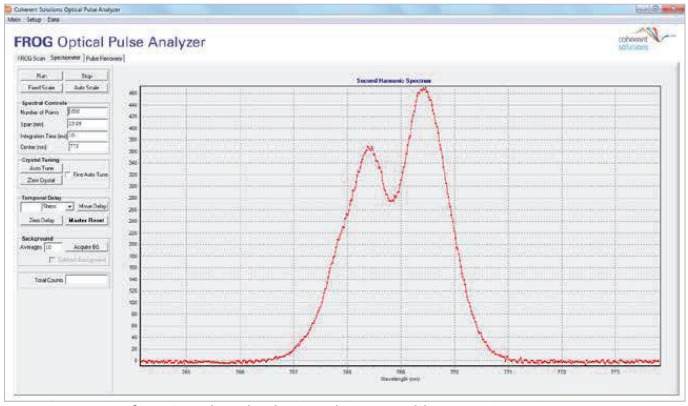

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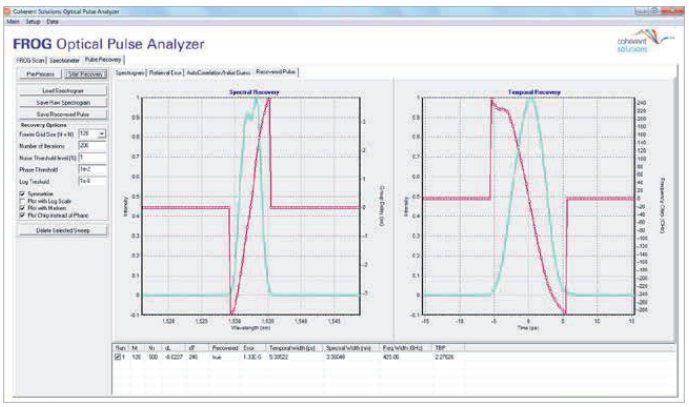

FROG pulse recovery functionality showing the pulse shape and chirp in both temporal and spectral domains.

FROG Applications

- Use the IQFROG to obtain the complete expression of electric field of your optical pulse, so that it can be used in numerical simulations.
- Characterize and optimize the optical pulses generated from lasers such as, Erbium Doped Fiber Laser, Gain switched laser, Saturable Absorber mode-locked laser and externally modulated pulse source.
- Generate transform-limited pulses by compensating for the chirp measured using IQFROG.
- Generate optical pulses with desired intensity and chirp profiles using an arbitrary optical filter and check the results with an IQFROG.
- Device characterization using comparative measurements of input and output pulses.

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Papers Relating to FROG Measurement Techniques

Frequency Resolved Optical Gating with the use of Second Harmonic Generation
K.W. Delong, R. Trebino, J. Hunter, W.E. White.
Nov '94 J Opt Soc Am B-Opt Physics, Vol 11, Iss 11, pp 2206-2215.

Complete Characterisation of pulse propagation in optical fibres using Frequency-Resolved Optical Gating
L.P. Barry, J.M. Dudley, P.M. Bollond, J.D. Harvey, R. Leonhardt.
Dec '96 Electron Lett, Vol 32, Iss 25, pp 2339-2340.

Direct measurement of pulse distortion near the zero-dispersion wavelength in optical fiber by Frequency-Resolved Optical Gating
L.P. Barry, J.M. Dudley, P.G. Bollond, J.D. Harvey, R. Leonhardt.
Apr '97 Optics Lett, Vol 22, Iss 7, pp 457-459.

Simultaneous measurement of optical fibre non-linearity and dispersion using Frequency Resolved Optical Gating
L.P Barry, J.M. Dudley, P.G. Bollond, J.D. Harvey, R. Leonhardt.
Apr '97 Electron Lett, Vol 33, Iss 8, pp 707-708.

Optimization of Optical Data Transmitters for 40-Gb/s Lightwave Systems Using Frequency Resolved Optical Gating
L.P. Barry, S. Del burgo, B.C. Thomsen, D.A. Reid,
R.T. Watts, J.D. Harvey.
July '02 Photonics Tech Lett, Vol 14, Iss 7, pp 971-974.

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Temporal resolution	15 fs
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Spectral resolution	120 pm
Pulse repetition rate	Independent
Input RF clock required	No
Input connector type	FC/APC or FC/PC
Input peak power (saturation)	7 W2
Input peak power (sensitivity) [c]	0.005 W^2

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Ordering Information: IQFROG 1.5: µm

IQFROG-1.5 MICRON - XX
Connector Type
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